

## **Ecosystem Quality Problem Statements**

The Bay-Delta Ecosystem does not support high quality habitats  
• for diverse and valuable plant and animal species. Many  
plant and animal species that use the Bay-Delta have  
experienced moderate to severe declines. The major problems  
for the aquatic and wetland habitats are outlined below:

- A. **Important Aquatic Habitats** are inadequate to support production and survival of native and other desirable estuarine and anadromous fish in the estuary. Examples of fishes that have experienced declines related to changes in Delta habitat include delta smelt, longfin smelt, Sacramento splittail, Chinook salmon, striped bass, and American shad. The problems for specific aquatic habitats include:
1. **Lack of Shallow Riverine Habitat** limits spawning success and early survival of many estuarine and anadromous fish in the estuary. Examples of affected species include Sacramento splittail, Chinook salmon, striped bass, delta smelt, American shad.
    - a) **Lack of Riverine Edge Habitats** limits spawning success and survival of juveniles of many fish species that use such habitats for spawning and rearing (e.g., Sacramento splittail, delta smelt, Largemouth Bass, and Chinook salmon).
    - b) **Lack of Shallow Shoal Habitat** within the main channels of the Delta and upper Bay limits shallow foraging habitat for juveniles of many estuarine fish (e.g., Sacramento splittail, striped bass, delta smelt, longfin smelt, starry flounder, and white sturgeon).
  2. **Lack of Shaded Riverine Aquatic Habitat** limits growth and survival of estuarine resident and anadromous fish in the estuary (e.g., Sacramento splittail, Chinook salmon, and tule perch).
    - a) **Lack of Riparian Woodland** limits cover and terrestrial food production for Delta fish.
    - b) **Lack of Large, Woody Debris** along Delta levees limits feeding and refuge habitat for juvenile and adult fish in the Delta.
    - c) **Lack of Shaded Habitat** results in elevated water temperatures.
  3. **Reduced quality Lack of Tidal Slough Habitat** limits the fish-production capacity of the Delta (e.g., delta smelt, Chinook salmon, striped bass, Sacramento splittail, and Tule Perch and copepods).
    - a) **Degradation of Dead-End Sloughs** habitat reduces areas available for spawning and rearing of some native resident fish species.
    - b) **Abundant Water Hyacinth** may limit productivity of tidal slough habitats.
    - c) **Primary biological production** during tidal cycling is limited by lack of tidal slough habitat.
  4. **Springtime Upstream Relocation of Estuary Entrapment/Null Zone Habitat** by low Delta outflow limits production of fish and their prey in the estuary (e.g., delta smelt, longfin smelt, and striped bass).
    - a) **Saltwater Intrusion into Suisun Bay** reduces the bay's value as a low-salinity nursery are

- b) **Low Salinity (less than 10 ppt) Habitat** is confined to deeper channels in the Western Delta where it is of limited value as compared to Suisun Bay.
  - c) **Brackish Water (1 to 25 ppt) Habitat** occurs less frequently in San Pablo Bay with reductions in Delta outflow during the winter and spring which may limit production of bay species such as bay shrimp, starry flounder, Pacific herring, and dungeness crab.
- 5. **Reduced and Altered Transport Flows** hinder successful movement of larval and juvenile fish from spawning habitats to nursery habitats in the Delta and Bay (e.g., longfin smelt, striped bass, Chinook salmon, and Sacramento splittail).
  - a) **Reduced Transport of Young Fish from the Delta to Suisun Bay** nursery areas because of low Delta outflow reduces growth, survival, and abundance of important estuarine fish. (e.g., striped bass and delta smelt)
  - b) **Reduced Transport of Young Fish through the Delta** to the ocean limits survival and abundance of estuarine and anadromous fish. (e.g., Chinook salmon, steelhead, and American shad).
  - c) **Increased Transport of Young Fish from North to South across the Delta** and direct entrainment of fish because of high export-to-inflow ratios reduces survival and abundance of estuarine and anadromous fish (e.g., Chinook salmon, delta smelt, striped bass, steelhead, and American shad).
  - d) **Local Structures** block and alter transport flows and increase predation rates (e.g., Chinook salmon).
- 6. **Altered Migratory Cues** disrupt upstream and downstream movement of anadromous and estuarine fish (e.g., Chinook salmon, steel head, and white sturgeon).
  - a) **Upstream Migration of Adult Salmonids through the Delta is Disrupted** by lack of olfactory cues caused by export of spawning-river water in and above the Delta.
  - b) **Outmigration of Juvenile Fish through the Delta is Hindered** by net downstream flow cues toward South Delta export pumps (e.g., delta smelt, striped bass, American shad, and Sacramento splittail).
  - c) **Upstream Migration of Adult Estuarine Fish into Delta and River Spawning Areas is Hindered** by altered net flow of water across the Delta.
- 7. **Reduced Food Web Productivity** in aquatic habitats limits forage availability for fish species (e.g., delta smelt, longfin smelt, Sacramento splittail, Chinook salmon, striped bass, starry flounder, bay shrimp, and neomysis)
  - a) **Entrainment of Food Productivity** by diversions limits habitat suitability for desirable fish species.
  - b) **High Concentrations of Toxicants** in the water column and in sediments reduces production and survival of aquatic plants and invertebrates.
  - c) **Introduced Species** compete for food and habitat space with desirable species organisms.

- d) **Reduced Residence Time of Water** in Delta channels limits plankton blooms.
  - e) **Reduction in Nutrient Inputs** from wetland and riparian habitats may limit aquatic productivity.
  - f) **High Salinity Levels** in Delta aquatic habitats limits seasonal productivity patterns of estuarine food-chain organisms.
  - g) **Reduction and Seasonal Shift of Freshwater Inflow to the Delta** directly limits primary and secondary productivity of the estuary during critical periods.
8. **Excessive Concentrations of Toxic Constituents and their Bioaccumulation** directly limits survival and growth of desirable fish species (e.g., delta smelt, longfin smelt, Sacramento splittail, Chinook salmon, striped bass, and starry flounder).
- a) **Excessive Pesticide Residues** directly affect some fish and wildlife species.
  - b) **Excessive Hydrocarbons, Heavy Metals, and other Pollutants** directly harm some fish and wildlife species.
- B. **Important Wetland Habitats** are inadequate to support production and survival of wildlife species in the Delta. The problems for the specific wetland habitats include:
- 1. **Lack of Brackish Tidal Marsh Habitats** of high quality limits supportable populations of wildlife species that inhabit them (e.g., Suisun Slough thistle, Suisun Song Sparrow, and Snowy Egret).
    - a) **Altered Vegetation Composition** in brackish marshes caused by changes in salinity levels limits habitat suitability for some species.
    - b) **Reduced Areal Extent and Patchiness** of brackish marsh limits wildlife populations and genetic exchange.
    - c) **Disconnection of Supporting Habitats** such as aquatic habitats and riparian woodlands and adjacent uplands limits productivity in brackish marshes.
  - 2. **Lack of Freshwater Habitats** of high quality limits supportable populations of native wildlife species (e.g., giant garter snake, tri-colored blackbird, and Mason's lilaeopsis).
    - a) **Inappropriate Increased Salinity Levels** do not support desirable vegetation composition and thereby limit habitat suitability for some species.
    - b) **Reduced Areal Extent** of high quality freshwater marsh habitats does not support sustainable populations sizes of some wildlife species.
    - c) **Lack of connection between** of freshwater marsh habitats does not provide corridors for population movement and genetic exchange.
    - d) **Vulnerability of Levee Failure on Delta Islands** threatens sustainability of existing freshwater marshes.
  - 3. **Limited Riparian Woodland Habitats** of high quality in the Delta reduces diversity and sizes of supportable native wildlife populations (e.g., Swainson's hawk, riparian brush rabbit, western yellow-billed cuckoo, neotropical migrant songbirds, and northern California black walnut).

- a) **Lack of Riparian Habitat Structure** near foraging areas limits nesting opportunities for some native bird species.
  - b) **Fragmentation** of riparian habitat patches does not provide corridors for population movement and genetic exchange.
  - c) **Limited Areal Extent** of riparian habitats prevents use by some native bird species.
  - d) **Disconnection of Supporting Habitats** such as aquatic habitats and brackish marshes limits productivity in riparian woodlands.
4. **Reduced Breeding Waterfowl Habitats** limits production of desired populations of dabbling ducks (e.g., mallard, cinnamon teal, and wood duck).
- a) **Lack of Brood Habitat** of high quality near nesting habitat limits dabbling duck production.
  - b) **Lack of Nesting Habitat** of high quality near brood habitat limits dabbling duck production.
5. **Reduction in Wintering Wildlife Habitats** for foraging and resting limits desired populations of wintering waterfowl (e.g., Aleutian Canada goose, mallard, tundra swan, white-fronted goose and shore birds).
- a) **Decreasing Waste Grain** on agricultural lands limits availability of wildlife forage.
  - b) **Lack of Resting Areas** near foraging areas limits wintering wildlife populations that can be supported in the Delta.
  - c) **Reduction in Historical Foraging Habitats** (e.g., freshwater marsh and brackish water marsh) limits availability of high quality foraging areas for wintering wildlife.
  - d) **Vulnerability of Levee Failure on Delta Islands** threatens sustainability of some wintering wildlife habitats.
6. **Lack of Managed Permanent Pasture Habitat** limits wintering crane populations (e.g., lesser sandhill crane, greater sandhill crane).
- a) **Lack of Foraging Habitats** of high quality for cranes in proximity to roosting habitats limits supportable wintering populations.
  - b) **Lack of Roosting Habitats** of high quality for cranes in proximity to foraging habitats limits supportable wintering populations.
7. **Restricted Flood Plains and Associated Riparian Habitat** of sufficient size and high quality in the Delta reduce the diversity and sizes of fish and wildlife populations.
- a) **Lack of Suitable Flood Plains** reduces the availability of temporarily flooded spawning habitat for fish such as the Sacramento splittail.
  - b) **Narrow Restricted Channels** increase the risk of levee failure and subsequent catastrophic losses of wildlife habitat protected by these levees.
- C. **Populations of some species of plants and animals dependent on the Delta have declined.**

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1. **Many species in the Bay-Delta system** have declined to the point that they are threatened, endangered, or species of special concern.
2. **Many species of economic importance** have declined.
3. **Some prey or food species** have declined to the point that they no longer adequately support populations of predator species.